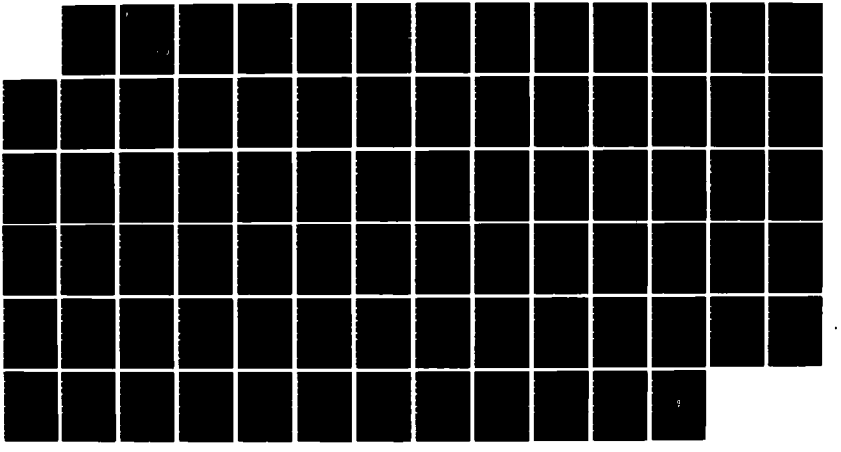
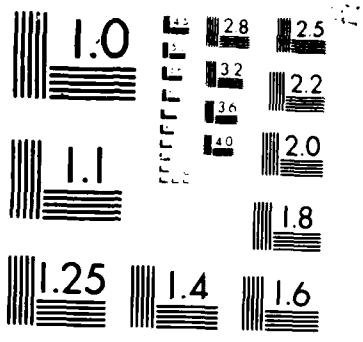
AD-A177 484 HUMAN FACTORS EVALUATION CHECKLIST FOR TANKS(U) HUMAN ENGINEERING LAB ABERDEEN PROVING GROUND MD J N CLINGAN ET AL. OCT 86 HEL-TN-8-86 1/1

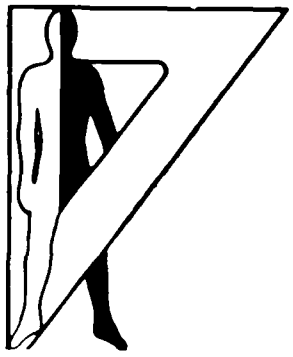
UNCLASSIFIED F/G 14/2 NL





MICROCOPY RESOLUTION TEST CHART

(12)



AD

TECHNICAL NOTE 8-86

HUMAN FACTORS EVALUATION CHECKLIST FOR TANKS

James N. Clingan
Ralph C. Akens

October 1986

Approved for public release;
distribution is unlimited.

U. S. ARMY HUMAN ENGINEERING LABORATORY

Aberdeen Proving Ground, Maryland

Destroy this report when no longer needed.
Do not return it to the originator.

The findings in this report are not to be construed as an official Department of the Army position unless so designated by other authorized documents.

Use of trade names in this report does not constitute an official endorsement or approval of the use of such commercial products.

SECURITY CLASSIFICATION OF THIS PAGE *(When Data Entered)*

REPORT DOCUMENTATION PAGE

READ INSTRUCTIONS BEFORE COMPLETING FORM

1. REPORT NUMBER: Technical Note 1-86	2. GOVT ACCESSION NO: A177 484
	3. RECIPIENT'S CATALOG NUMBER
4. TITLE *(and Subtitle)*: HUMAN FACTORS EVALUATION CHECKLIST FOR TANKS	5. TYPE OF REPORT & PERIOD COVERED: Final
	6. PERFORMING ORG. REPORT NUMBER
7. AUTHOR(s): James N. Clingan, Ralph C. Akens	8. CONTRACT OR GRANT NUMBER(s)
9. PERFORMING ORGANIZATION NAME AND ADDRESS: Human Engineering Laboratory, Aberdeen Proving Ground, MD 21005-5001	10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS
11. CONTROLLING OFFICE NAME AND ADDRESS	12. REPORT DATE: October 1986
	13. NUMBER OF PAGES: 80
14. MONITORING AGENCY NAME & ADDRESS *(if different from Controlling Office)*	15. SECURITY CLASS. *(of this report)*: Unclassified
	15a. DECLASSIFICATION DOWNGRADING SCHEDULE

16. DISTRIBUTION STATEMENT *(of this Report)*

Approved for public release;
distribution is unlimited.

17. DISTRIBUTION STATEMENT *(of the abstract entered in Block 20, if different from Report)*

18. SUPPLEMENTARY NOTES

19. KEY WORDS *(Continue on reverse side if necessary and identify by block number)*

Ventilation	Controls/Displays	Integration
Color-Coding	Vision	Battlefield Assessment
Fume Extraction	Accessibility	Effectiveness
Maintainability	Workspace	Protection

20. ABSTRACT *(Continue on reverse side if necessary and identify by block number)*

The purpose of this checklist is to provide a systematic approach to performing a human factors evaluation of the soldier-machine interface with main battle tanks.

DD FORM 1 JAN 73 1473 EDITION OF 1 NOV 65 IS OBSOLETE

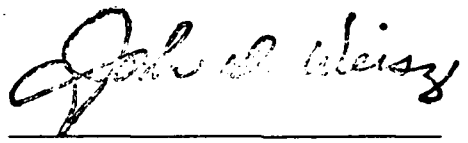
SECURITY CLASSIFICATION OF THIS PAGE *(When Data Entered)*

TECHNICAL NOTE 8-86

HUMAN FACTORS EVALUATION CHECKLIST FOR TANKS

James N. Clingan
Ralph C. Akens

October 1986

APPROVED: 

JOHN D. WEISZ
Director
Human Engineering Laboratory

Approved for public release;
distribution is unlimited.

HUMAN ENGINEERING LABORATORY
Aberdeen Proving Ground, Maryland 21005-5001

CONTENTS

HUMAN FACTORS EVALUATION CHECKLIST FOR TANKS

BACKGROUND

The human factors evaluation checklist (HFEC) was developed as a tool for use by the Human Engineering Evaluation Test (HEET) Team in conducting human factors analyses on foreign tanks of friendly countries. The checklist is a standardized and itemized review of human interface design questions, covering step by step areas of the tank where human factors interact with operations and maintenance--from training to health and safety.

This type of checklist did not exist when the HEET team was established in 1985 to develop an in-depth data base of foreign equipment design in support of the Human Engineering Laboratory's (HEL) research and development effort.

It was determined by the team that if a thorough analysis was to be performed, specific technical questions for tanks needed to be asked and answered. The checklist was compiled from questionnaires, numerous existing Human Factors Engineering Analyses (HFEAs), and brainstorming sessions by the HEET team. The checklist uses both numerical ratings and descriptive comments for recording information.

The checklist has proven to be very valuable for use by the HEET team. The wide range of human factors design questions provides for a thorough evaluation of all main battle tanks. Although its primary use is for tanks, it is sufficiently flexible to be used for armored fighting vehicles (AFVs) and can be expanded to include all armored vehicles.

PURPOSE

The purpose of this checklist is to provide a systematic approach for anyone who desires a thorough evaluation when performing a human factors evaluation of the soldier-machine interface with main battle tanks. This checklist may be used as a supplementary assessment when limited resources and manpower restrict formal human factors analyses. The checklist may also provide the means to compile information for publishing reports.

USER CONSIDERATIONS

Based on HEET team experience with conducting human factors evaluation potential users of this checklist should consider the following recommendations before attempting an evaluation:

- Persons performing an HFEC should be classified anthropometrically prior to the evaluation for stature; functional arm reach; weight; buttock-knee length; and eye height, sitting.

● This checklist should be used by persons who are thoroughly familiar with tank design and operation.

● This checklist is not intended to be used in a laboratory setting, but rather in field evaluations.

● If possible, the persons conducting the evaluation should be permitted to drive the tank, fire the weapons, and assist the crew with maintenance.

● Experienced tank crew should be available to answer questions which require hands-on experience and knowledge of the particular vehicle being evaluated. Their presence is especially critical to answering questions pertaining to driving, firing weapons, and other areas when persons conducting the evaluation may not be in a position to physically operate the tank or system.

● Under the comments section of each question, there is blank space for the individuals performing the evaluation to address their specific questions. It is recommended that this space be used to record specific data such as hatch measurements, seat size, etc., and to record the crew's comments.

● It is recommended that persons performing an evaluation be thoroughly familiar with the different mission-oriented protection posture (MOPP) levels for nuclear, biological, and chemical (NBC) operations and arctic clothing when evaluating vehicles based on these considerations.

CHECKLIST

1. INGRESS/EGRESS

1.1 While standing on the ground, face the vehicle's boarding path and inspect all handholds and footholds. Consider arctic and NBC garments (for 5th - 95th percentile male). Are handholds and footholds adequate in number and location?

Extremely Adequate			Adequate			Extremely Inadequate
7	6	5	4	3	2	1

COMMENTS:

LOCATIONS:

PROBLEMS:

1.2 Are nonskid surfaces provided on boarding path?

Extremely Adequate			Adequate			Extremely Inadequate
7	6	5	4	3	2	1

COMMENTS:

TYPE:

PROBLEMS:

1.3 Mount the vehicle, using the boarding path. Are there any obstructions? Yes or No?

COMMENTS:

PROBLEMS:

DESCRIBE BOARDING PATH:

1.4 Are there alternate boarding paths based on considerations detailed above? Yes or No?

COMMENTS:

DESCRIBE ALTERNATE BOARDING PATHS:

1.5 Open primary (loader's) entrance hatch from outside the vehicle. Judge difficulty of unlocking the vehicle.

Extremely Easy						Extremely Difficult
			Average			
7	6	5	4	3	2	1

COMMENTS:

DESCRIBE PROCEDURE:

1.5.1 Are locking mechanisms vulnerable to damage, rendering the vehicle difficult to secure? Yes or No?

COMMENTS:

DESCRIBE LOCKING MECHANISMS:

1.5.2 Judge effort required to open primary hatch and secure it from outside of vehicle.

Extremely Easy						Extremely Difficult
			Average			
7	6	5	4	3	2	1

COMMENTS:

DESCRIBE PROCEDURE:

1.6 Is hatch opening adequate in size? Consider NBC/arctic clothing and personnel equipment.

Extremely Adequate			Adequate			Extremely Inadequate
7	6	5	4	3	2	1

COMMENTS:

HATCH MEASUREMENTS:

1.7 Is entry path into vehicle adequately padded to prevent injury to personnel or damage to equipment?

Extremely Adequate			Adequate			Extremely Inadequate
7	6	5	4	3	2	1

COMMENTS:

1.8 While inside vehicle, close primary hatch. Judge difficulty of releasing hatch from secured position and pulling it closed.

Extremely Easy			Average			Extremely Difficult
7	6	5	4	3	2	1

COMMENTS:

DESCRIBE PROCEDURE:

1.9 Judge difficulty of locking hatch from inside vehicle.

Extremely Easy			Average			Extremely Difficult
7	6	5	4	3	2	1

COMMENTS:

DESCRIBE PROCEDURE:

1.10 Open hatch. Judge difficulty of opening hatch and securing it in the open position.

Extremely Easy						Extremely Difficult
7	6	5	Average 4	3	2	1

COMMENTS:

1.11 Could crewmen exit quickly through primary hatch during an emergency?

Extremely Easy						Extremely Difficult
7	6	5	Average 4	3	2	1

COMMENTS:

DESCRIBE PROCEDURE:

1.12 Dismount venicle, using egress path. Are there any new obstructions not encountered during ingress? Yes or No?

COMMENTS:

1.13 Is there an emergency hatch provided separate from normal crew hatches (an escape hatch, for example)? Yes or No?

COMMENTS:

LOCATION:

HATCH MEASUREMENTS:

2. PASSAGE BETWEEN CREW STATIONS WITHIN THE VEHICLE

2.1 Starting from the primary entrance hatch, judge difficulty in time and effort to get to each of the following crew stations: Consider NBC/arctic clothing.

2.1.1 Loader's Station

Extremely Easy			Average			Extremely Difficult
7	6	5	4	3	2	1

COMMENTS:

PROCEDURE:

2.1.2 Commander's Station

Extremely Easy			Average			Extremely Difficult
7	6	5	4	3	2	1

COMMENTS:

PROCEDURE:

2.1.3 Gunner's Station

Extremely Easy			Average			Extremely Difficult
7	6	5	4	3	2	1

COMMENTS:

PROCEDURE:

2.1.3 Must the gunner's seatback be removed to enter station? Yes or No?

COMMENTS:

2.1.4 Driver's Station

2.1.4.1 With the turret in the travel lock position, must the turret be rotated for the driver to reach his station from within the vehicle? Yes or No?

COMMENTS:

ENTRY PATH MEASUREMENTS:

2.1.4.2 Judge effort required for driver to enter driver's station from turret, considering obstructions and NBC/arctic garments.

Extremely Easy			Average			Extremely Difficult
7	6	5	4	3	2	1

COMMENTS:

DESCRIBE PROCEDURES:

2.1.4.3 Could driver exit quickly through this passageway in an emergency?

Extremely Easy			Average			Extremely Difficult
7	6	5	4	3	2	1

COMMENTS:

EXPLAIN:

2.1.4.4 Could other crewmen remove an incapacitated driver through this passageway?

Extremely Easy						Extremely Difficult
			Average			
7	6	5	4	3	2	1

COMMENTS:

DESCRIBE PROCEDURE:

2.1.5 Judge the difficulty of removing an incapacitated gunner from his station and moving him out of the vehicle via the main hatch.

Extremely Easy						Extremely Difficult
			Average			
7	6	5	4	3	2	1

COMMENTS:

DESCRIBE PROCEDURES:

3. DRIVER'S STATION

3.1 Driver's Seat

3.1.1 If driver's seat adjusts vertically to provide for both open- and closed-hatch operation as well as differences in seated eye height (in the closed-hatch position), evaluate the following: Can the driver see and operate all hand and foot controls as well as see displays in the full range of vertical seated positions required for the 5th and 95th percentile driver in open- and closed-hatch modes?

Extremely Adequate			Adequate			Extremely Inadequate
7	6	5	4	3	2	1

COMMENTS:

VERTICAL ADJUSTMENT MEASUREMENTS:

3.1.2 Is lumbar (lower back) support provided (6 inches above compressed seat cushion to 15" total height) to reduce driver fatigue?

Extremely Adequate			Adequate			Extremely Inadequate
7	6	5	4	3	2	1

COMMENTS:

SEATBACK MEASUREMENTS:

3.1.3 Is driver's seat equipped with restraints and seat belts to protect driver during violent maneuvers? Yes or No?

COMMENTS:

IF YES, DESCRIBE:

3.1.4 Is driver's seat designed so that it does not restrict blood flow in the popliteal area of the leg? Yes or No?

COMMENTS:

DESCRIBE SEAT DESIGN:

3.1.5 If the driver's seat reclines more than 30°, is it equipped with an adjustable headrest to provide head support? Yes or No?

COMMENTS:

NOTE ANY PROBLEMS:

3.1.6 Could seat covering material cause the driver to sweat when he is in prolonged contact with seat? Yes or No?

COMMENTS:

DESCRIBE MATERIAL:

3.1.7 Could seat covering material become excessively hot (hot enough to burn exposed flesh) when vehicle operates in warm climate? Yes or No?

COMMENTS:

3.2 Driver's Workspace

3.2.1 Does the full range of tank drivers wearing the full range of Army clothing have the necessary workspace to:

3.2.1.1 Perform dynamic operations, such as emergency steering or evasive maneuvers, without elbow contact with adjacent equipment?

Extremely Adequate			Average			Extremely Inadequate
7	6	5	4	3	2	1

COMMENTS:

NOTE PROBLEMS:

3.2.1.2 Perform dynamic operations, such as emergency braking, without knee contact with adjacent equipment?

Extremely Adequate			Average			Extremely Inadequate
7	6	5	4	3	2	1

COMMENTS:

NOTE PROBLEMS:

3.2.1.3 Effectively access and operate all hand and foot controls (most critical and/or frequently used hand controls should not be more than 30" from a vertical line through the seat reference point).

Extremely Adequate			Average			Extremely Inadequate
7	6	5	4	3	2	1

COMMENTS:

3.2.1.4 Have effective visibility of all controls and displays during both day and night operations?

Extremely Good			Adequate			Extremely Poor
7	6	5	4	3	2	1

COMMENTS:

NOTE PROBLEMS:

3.3 Driver's Displays and Controls

3.3.1 Displays

3.3.1.1 Are the displays adequate for the tasks the driver must perform?

Extremely Adequate			Adequate			Extremely Inadequate
7	6	5	4	3	2	1

COMMENTS:

NOTE PROBLEMS:

3.3.1.2 Are size, shape, contrast, and spacing between displays appropriate for intended usage?

Extremely Adequate			Adequate			Extremely Inadequate
7	6	5	4	3	2	1

COMMENTS:

NOTE PROBLEMS:

3.3.1.3 Are similar display functions grouped together? Yes or No?

COMMENTS:

NOTE PROBLEM:

3.3.1.4 Are displays readable? Yes or No?

COMMENTS:

NOTE PROBLEM:

3.3.1.5 Are displays illuminated? Yes or No?

COMMENTS:

NOTE PROBLEM:

3.3.1.5.1 Can display illumination be dimmed? Yes or No?

COMMENTS:

NOTE PROBLEM:

3.3.1.6 Do displays make efficient use of color coding? Yes or No?

COMMENTS:

NOTE PROBLEM:

3.3.1.7 Are indicator lights grouped together, close to driver's line of sight? Yes or No?

COMMENTS:

NOTE PROBLEM:

3.3.1.8 Are indicator lights colored correctly, based on the following criteria? Yes or No?

COMMENTS:

IF NO, DESCRIBE:

RED = Critical (system inoperative or dangerous to crew safety)

YELLOW = Caution (alerts driver to situation where caution, re-check, delay is necessary)

GREEN = Safe (satisfactory operation or status)

WHITE = General status (imply neither success or failure)

3.3.1.9 Can indicator lights be tested? Yes or No?

COMMENTS:

METHOD:

3.3.1.10 Can indicator lights be dimmed? Yes or No?

COMMENTS:

IF YES, DESCRIBE METHOD:

3.3.1.11 Is nomenclature used of appropriate size, contrast with panel, and readable? Yes or No?

COMMENTS:

3.3.1.12 Are operator's decals and placards readable and properly placed? Yes or No?

COMMENTS:

3.3.2 Controls

3.3.2.1 Are the controls provided the best choice for the tasks the driver must perform? Yes or No?

COMMENTS:

3.3.2.2 Are size, shape, and spacing between the controls appropriate for effective intended usage? Yes or No?

COMMENTS:

3.3.2.3 Are controls positioned to facilitate sequential usage? Yes or No?

COMMENTS:

PROBLEMS:

3.3.2.4 Are controls accessible (not behind steering, for example, or too close together to permit operation, while wearing NBC/arctic garments, by the 95th percentile male)? Yes or No?

COMMENTS:

DESCRIBE ANY PROBLEMS:

3.3.2.5 Are controls illuminated? Yes or No?

COMMENTS:

3.3.2.6 Is direction of control movement correct based on following criteria: Yes or No?

COMMENTS:

ON = up, right, clockwise, pull

OFF = down, left, counterclockwise, push

INCREASE = forward, up, right, clockwise

DECREASE = rearward, down, left, counterclockwise

3.3.2.7 Are controls located near associated displays? Yes or No?

COMMENTS:

3.3.2.8 Is effort required to operate hand controls excessive (i.e., more than 50 foot-pounds for two hands or more than 30 foot-pounds for one hand)? Yes or No?

COMMENTS:

POUND PER SQUARE INCH (PSI) MEASUREMENTS:

3.3.2.9 Is effort required to operate foot controls excessive (i.e., more than 200 psi)?

Extremely Easy						Extremely Difficult
			Average			
7	6	5	4	3	2	1

COMMENTS:

PSI MEASUREMENTS:

3.3.2.10 Have protective covers or guards been placed over controls or switches where appropriate? Yes or No?

COMMENTS:

DESCRIBE PROBLEM:

3.3.2.11 Are protective covers positioned to permit observation of essential displays, nomenclature, indicators, or gauges when flipped into the open position?

Extremely Adequate						Extremely Inadequate
			Adequate			
7	6	5	4	3	2	1

COMMENTS:

DESCRIBE PROBLEM:

3.3.2.12 Is the steering device large enough to assure complete control of the vehicle?

Extremely Adequate			Adequate			Extremely Inadequate
7	6	5	4	3	2	1

COMMENTS:

DESCRIBE STEERING DEVICE:

MEASUREMENTS:

3.4 Driver NBC Protection

3.4.1 If a collective protection system is used, is hose readily accessible to the driver in both open- and closed-hatch mode?

Extremely Good			Average			Extremely Poor
7	6	5	4	3	2	1

COMMENTS:

3.4.2 If a collective protection system is used, is regulated heater provided and is it easy to access and use?

Extremely Easy			Average			Extremely Difficult
7	6	5	4	3	2	1

COMMENTS:

LOCATION:

3.4.3 If other NBC protection system such as ventilated facepiece or cooling vest is used, judge effectiveness of system for the driver.

Extremely Effective			Effective			Extremely Ineffective
7	6	5	4	3	2	1

COMMENTS:

METHOD OF EVALUATION:

3.5 Driver's Hatch

3.5.1 Is the driver's hatch easy to open and close using the hatch operating controls?

Extremely Easy			Average			Extremely Difficult
7	6	5	4	3	2	1

COMMENTS:

DESCRIBE PROCEDURE:

3.5.2 Judge whether driver's hatch is adequate in size, considering NBC/arctic garments and the 95th percentile male.

Extremely Adequate			Average			Extremely Inadequate
7	6	5	4	3	2	1

COMMENTS:

HATCH MEASUREMENTS:

3.5.3 In the open-hatch mode is the driver in danger of being struck by the traversing turret? Is any type of traverse warning signal provided? Yes or No?

Definitely not Dangerous				Definitely Dangerous
5	4	3	2	1

COMMENTS:

DESCRIBE PROBLEM:

3.5.4 Can driver transition from open- to closed-hatch mode without stopping vehicle?

Extremely Easy			Not Difficult			Extremely Difficult
7	6	5	4	3	2	1

COMMENTS:

DESCRIBE PROCEDURES:

3.6 Driver's Vision

3.6.1 Closed-Hatch Vision

3.6.1.1 Can the driver see a point on the ground 20 feet in front of the tank, using the daylight, closed-hatch viewing system (hereafter referred to as DAY-CHV)?

Extremely Good			Adequate			Extremely Poor
7	6	5	4	3	2	1

COMMENTS:

NUMBER OF PERISCOPES:

PERISCOPE DIMENSIONS:

3.6.1.2 Can the driver see to the left and right (full 180°) using all units of the DAY-CHV system?

Extremely Good			Adequate			Extremely Poor
7	6	5	4	3	2	1

COMMENTS:

DESCRIBE PROBLEMS:

3.6.1.3 Can the driver see upward 15° using the DAY-CHV system?

Extremely Good			Adequate			Extremely Poor
7	6	5	4	3	2	1

COMMENTS:

DESCRIBE PROBLEMS:

3.6.1.4 Does the DAY-CHV system have an adequate defroster for operation in cold weather?

Extremely Adequate			Adequate			Extremely Inadequate
7	6	5	4	3	2	1

COMMENTS:

TYPE:

3.6.1.5 Does DAY-CHV system have adequate wipers to remove rain, snow, dust, or mud as required?

Extremely Adequate			Adequate			Extremely Inadequate
7	6	5	4	3	2	1

COMMENTS:

3.6.1.6 Is an adequate night vision device provided to allow driving after dark?

Extremely Adequate			Adequate			Extremely Inadequate
7	6	5	4	3	2	1

COMMENTS:

TYPE OF NIGHT VISION DEVICE:

3.6.1.7 Can the driver see a point on the ground 20 feet in front of the tank when normally seated (open-hatch mode) with eyes just over the edge of the hatch (looking down across the glacis plate)?

[illegible]					Extremely Poor
[illegible]		Adequate			
[illegible]		4	3	2	1

[illegible]

[illegible]

[illegible] above, can driver see to the left and the [illegible] moving his neck but not rising above designated [illegible]

[illegible]					Extremely Poor
[illegible]		Adequate			
[illegible]	[illegible]	4	3	2	1

COMMENTS:

DESCRIBE PROBLEMS:

3.7 Driver's Escape Hatches

3.7.1 Is driver's escape hatch available?

Extremely Good						Extremely Poor
			Adequate			
7	6	5	4	3	2	1

COMMENTS:

DESCRIBE REMOVAL PROCEDURES:

3.7.2 Is driver's escape hatch accessible?

Extremely Easy To Get At			Adequate			Extremely Difficult to Get At
7	6	5	4	3	2	1

COMMENTS:

DESCRIBE PROBLEMS:

4. COMMANDER'S STATION

4.1 Commander's Seat and Platform Configuration

4.1.1 Judge overall quality of tank commander's seat, considering adjustability, cushioning, size, and back angle.

Extremely Good			Adequate			Extremely Poor
7	6	5	4	3	2	1

COMMENTS:

SEAT MEASUREMENTS:

DESCRIBE SEAT:

MEASURE ADJUSTMENTS:

4.1.2 If the commander's seat adjusts vertically to provide for both open- and closed-hatch operation, and for differences in seated eye height (in the closed-hatch mode), evaluate the following: Can the tank commander see and operate all controls and displays in the full range of seat positions required for 5th to 95th percentile commanders in open- and closed-hatch mode?

Open Hatch:

Extremely Easy			Adequate			Extremely Difficult
7	6	5	4	3	2	1

Closed Hatch:

Extremely Easy			Adequate			Extremely Difficult
7	6	5	4	3	2	1

COMMENTS:

PROBLEMS:

4.1.3 Is lumbar (back) support provided (6 inches above compressed seat cushion, 15 inches tall) to reduce tank commander's fatigue?

Extremely Adequate			Adequate			Extremely Inadequate
7	6	5	4	3	2	1

COMMENTS:

SEAT MEASUREMENTS:

4.1.4 Could seat covering material cause the tank commander to sweat when in contact with it during prolonged operations? Yes or No?

COMMENTS:

DESCRIBE MATERIAL:

4.1.5 Could seat covering material become excessively hot (burn exposed [illegible] when vehicle operates in warm climates? Yes or No?

COMMENTS:

4.1.6 Is an adequate (arctic-sized) footrest provided to support the commander's feet when in the closed-hatch seated position?

Extremely Adequate			Adequate			Extremely Inadequate
7	6	5	4	3	2	1

COMMENTS:

DESCRIBE FOOTREST:

FOOTREST MEASUREMENTS:

4.1.7 Is an adequate (arctic-sized), vertically adjustable standing platform provided for the commander's use during open-hatch (head exposed) operations?

Extremely Adequate			Adequate			Extremely Inadequate
7	6	5	4	3	2	1

COMMENTS:

DESCRIBE PLATFORM:

ADJUSTMENT MEASUREMENTS:

4. COMMANDER'S STATION

4.1 Commander's Seat and Platform Configuration

4.1.1 Judge overall quality of tank commander's seat, considering adjustability, cushioning, size, and back angle.

Extremely Good			Adequate			Extremely Poor
7	6	5	4	3	2	1

COMMENTS:

SEAT MEASUREMENTS:

DESCRIBE SEAT:

MEASURE ADJUSTMENTS:

4.1.2 If the commander's seat adjusts vertically to provide for both open- and closed-hatch operation, and for differences in seated eye height (in the closed-hatch mode), evaluate the following: Can the tank commander see and operate all controls and displays in the full range of seat positions required for 5th to 95th percentile commanders in open- and closed-hatch mode?

Open Hatch:

Extremely Easy			Adequate			Extremely Difficult
7	6	5	4	3	2	1

Closed Hatch:

Extremely Easy			Adequate			Extremely Difficult
7	6	5	4	3	2	1

COMMENTS:

PROBLEMS:

4.1.3 Is lumbar (back) support provided (6 inches above compressed seat cushion, 15 inches tall) to reduce tank commander's fatigue?

Extremely Adequate			Adequate			Extremely Inadequate
7	6	5	4	3	2	1

COMMENTS:

SEAT MEASUREMENTS:

4.1.4 Could seat covering material cause the tank commander to sweat when in contact with it during prolonged operations? Yes or No?

COMMENTS:

DESCRIBE MATERIAL:

4.1.5 Could seat covering material become excessively hot (burn exposed flesh) when vehicle operates in warm climates? Yes or No?

COMMENTS:

4.1.6 Is an adequate (arctic-sized) footrest provided to support the commander's feet when in the closed-hatch seated position?

Extremely Adequate			Adequate			Extremely Inadequate
7	6	5	4	3	2	1

COMMENTS:

DESCRIBE FOOTREST:

FOOTREST MEASUREMENTS:

4.1.7 Is an adequate (arctic-sized), vertically adjustable standing platform provided for the commander's use during open-hatch (head exposed) operations?

Extremely Adequate			Adequate			Extremely Inadequate
7	6	5	4	3	2	1

COMMENTS:

DESCRIBE PLATFORM:

ADJUSTMENT MEASUREMENTS:

4.1.8 Can tank commander's seat be positioned to permit sitting in "name tag" defilade (head and shoulders exposed)? Yes or No?

COMMENTS:

DESCRIBE:

4.1.9 Would seat permit commander's rapid exit in event of an emergency? Yes or No?

COMMENTS:

PROBLEMS:

4.1.10 Have provisions been made to allow for open-hatch (waist high) operations (e.g., folding backrest or adjustable standing platform? Yes or No?

COMMENTS:

DESCRIBE:

4.1.11 Are all adjustment controls easily accessible in all positions (consider NBC/arctic garments)?

Extremely Easy			Average			Extremely Difficult
7	6	5	4	3	2	1

COMMENTS:

DESCRIBE CONTROLS:

4.2 Tank Commander's Workspace

4.2.1 Would the full range of tank commanders, wearing the full range of Army clothing, have the necessary workspace to:

4.2.1.1 Perform dynamic operations, such as transition from open- to closed-hatch mode, without personnel injury or equipment damage due to contact with station's components?

Definitely Not Dangerous		Average		Definitely Dangerous
5	4	3	2	1

COMMENTS:

DESCRIBE PROBLEMS:

4.2.1.2 Maintain satisfactory visibility of all controls and displays during both day and night operations? (Crew comments may be needed for night operations.)

Extremely Good			Adequate			Extremely Poor
7	6	5	4	3	2	1

COMMENTS:

DESCRIBE PROBLEMS:

4.2.1.3 Effectively use (closed hatch) the commander's (cupola) periscope to observe exterior terrain?

Extremely Adequate			Adequate			Extremely Inadequate
7	6	5	4	3	2	1

COMMENTS:

DESCRIBE CUPOLA:

4.2.1.4 Effectively rotate cupola (if so equipped) to improve fields o vision through periscope.

Extremely Easy			Adequate			Extremely Difficult
7	6	5	4	3	2	1

COMMENTS:

DESCRIBE ROTATION PROCEDURE:

PROBLEMS:

4.2.1.5 Efficiently sight and fire commander's weapon while in closed-hatch mode. Consider rotation of cupola, locations of periscopes, and fire controls.

Extremely Easy						Extremely Difficult
			Adequate			
7	6	5	4	3	2	1

COMMENTS:

PROBLEMS:

METHODS OF EVALUATION:

4.2.1.6 Efficiently sight and fire commander's weapon in open-hatch mode, according to consideration listed above.

Extremely Easy						Extremely Difficult
			Adequate			
7	6	5	4	3	2	1

COMMENTS:

PROBLEMS:

METHOD OF EVALUATION:

4.2.1.7 Efficiently access ammunition for commander's weapon and reload/perform simple maintenance or repairs as required.

Extremely Easy						Extremely Difficult
			Adequate			
7	6	5	4	3	2	1

COMMENTS:

PROBLEMS:

AMMO STOWAGE AREA:

4.2.1.8 Perform target acquisition and main gun firing procedures using commander's GPS (gunner's primary sight) extension (if so equipped) operating necessary controls and sighting without interference from adjacent hardware while operating in both open- and closed-hatch modes.

Open Hatch:

Extremely Easy						Extremely Difficult
			Adequate			
7	6	5	4	3	2	1

Closed Hatch:

Extremely Easy						Extremely Difficult
			Adequate			
7	6	5	4	3	2	1

COMMENTS:

PROBLEMS:

METHOD OF EVALUATION:

4.2.1.9 Effectively access communications equipment and make routine adjustments without having to leave station.

Extremely Easy						Extremely Difficult
			Adequate			
7	6	5	4	3	2	1

COMMENTS:

PROBLEMS:

LOCATION OF EQUIPMENT:

4.3 Commander's Controls and Displays

4.3.1 Are the controls and displays adequate for the tasks that the commander must perform?

Extremely Adequate						Extremely Inadequate
			Adequate			
7	6	5	4	3	2	1

COMMENTS:

4.3.2 Are size, shape, and spacing of the controls and displays appropriate for intended usage?

Extremely Good			Adequate			Extremely Poor
7	6	5	4	3	2	1

COMMENTS:

PROBLEMS:

4.3.3 Are similar controls and display functions grouped for sequential usage? Yes or No?

COMMENTS:

PROBLEMS:

4.3.4 Are controls and displays properly illuminated with dimmable light? Yes or No?

COMMENTS:

PROBLEMS:

4.3.5 Are indicator lights correctly colored based on criteria outlined in 3.3.1.8? Yes or No?

COMMENTS:

PROBLEMS:

4.3.6 Can indicator lights be tested? Yes or No?

COMMENTS:

DESCRIBE METHOD:

4.3.7 Can indicator lights be dimmed? Yes or No?

COMMENTS:

DESCRIBE METHOD:

4.3.8 Are directions of control movement correct (based on criteria outlined in 3.3.2.6)? Yes or No?

COMMENTS:

PROBLEMS:

4.3.9 Is nomenclature appropriate for size, contrast, location, and readability? Yes or No?

COMMENTS:

PROBLEMS:

4.3.10 Do hand controls require excessive effort for operation?

Extremely Easy						Extremely Difficult
			Adequate			
7	6	5	4	3	2	1

COMMENTS:

DESCRIBE PROBLEM:

4.3.11 If cupola is manually rotated, does locking/unlocking require excessive effort (more than 50 foot-pounds of force for two hands or more than 30 foot-pounds of force for one hand)?

Extremely Easy						Extremely Difficult
			Average			
7	6	5	4	3	2	1

COMMENTS:

DESCRIBE METHOD OF OPERATION:

PROBLEMS:

4.3.12 Have protection covers or guards been placed over controls or switches where appropriate? Yes or No?

COMMENTS:

DESCRIBE PROBLEMS:

4.4 Tank Commander's NBC Protection

4.4.1 If collective protection system is used, is hose readily accessible to the commander in both open- and closed-hatch modes?

Extremely Easy						Extremely Difficult
			Average			
7	6	5	4	3	2	1

COMMENTS:

DESCRIBE PROBLEMS:

4.4.2 If collective protection system is used, is a regulated inlet heater provided? Yes or No? Is it easy to use?

Extremely Easy						Extremely Difficult
			Adequate			
7	6	5	4	3	2	1

COMMENTS:

LOCATION:

4.4.3 If other NBC protection system such as a ventilated facepiece or cooling vest is used, judge effectiveness of system for commander.

Extremely Adequate						[illegible]
			Adequate			
7	6	5	4	3		

COMMENTS:

METHOD OF EVALUATION:

4.5 Tank Commander's Hatch

4.5.1 Is the commander's hatch easy to open and close, using the controls provided (consider all possible hatch modes)?

Extremely Easy						Extremely Difficult
			Average			
7	6	5	4	3	2	1

COMMENTS:

HATCH MEASUREMENTS:

DESCRIBE PROCEDURES:

4.5.2 Judge whether commander's hatch is adequate in size, considering NBC/arctic garments for full range of tank commanders.

Extremely Adequate						Extremely Inadequate
			Adequate			
7	6	5	4	3	2	1

COMMENTS:

PROBLEMS:

4.5.3 Does the commander's hatch provide partially open (pop-up) mode to allow unrestricted observation while maintaining overhead cover?
(With CVC helmet on).

Extremely Good						Extremely Poor
			Adequate			
7	6	5	4	3	2	1

COMMENTS:

MEASURE AMOUNT OF OPEN SPACE FROM TOP OF PERISCOPES TO HATCH:

4.5.4 Does the commander's hatch strike or interfere with any other turret component in any mode (i.e., strike loader's hatch or antenna mount)? Yes or No?

COMMENTS:

DESCRIBE PROBLEM:

4.6 Commander's Vision

4.6.1 Closed-Hatch Vision

4.6.1.1 Using the various commander's cupola periscopes/vision blocks, can the commander see the exterior terrain well enough to effectively perform target acquisition/engagement, as well as surveillance? **(to be answered only by experienced crewman)**

Extremely Well			Adequate			Extremely Poor
7	6	5	4	3	2	1

COMMENTS:

DESCRIBE PROBLEMS:

4.6.1.2 Using the commander's weapon periscope, can the commander see possible targets well enough to effectively engage them with his weapon? **(to be answered only by experienced crewman)**

Extremely Well			Adequate			Extremely Poor
7	6	5	4	3	2	1

COMMENTS:

METHOD OF EVALUATION:

PROBLEMS:

4.6.1.3 Has the commander been provided with any means to clear closed-hatch vision systems of frost, dust, mud, or other obstructions without exposing himself to fire? Yes or No?

COMMENTS:

4.6.1.4 If a night vision system has been provided for commander, evaluate its effectiveness for surveillance/target acquisition and engagement.

Extremely Good			Adequate			Extremely Poor
7	6	5	4	3	2	1

COMMENTS:

DESCRIBE NIGHT VISION SYSTEM:

METHOD OF EVALUATION:

5. GUNNER'S STATION

5.1 Gunner's Seat

5.1.1 Judge effectiveness of gunner's seat, considering adjustability, cushioning, size, and back angle.

Extremely Adequate			Adequate			Extremely Inadequate
7	6	5	4	3	2	1

COMMENTS:

SEAT MEASUREMENTS:

DESCRIBE SEAT:

PROBLEMS:

5.1.2 Does gunner's seat allow sufficient vertical and horizontal (front and rear) adjustment to compensate for seated eye height and leg length? Yes or No?

COMMENTS:

MEASURE VERTICAL ADJUSTMENT:

MEASURE HORIZONTAL ADJUSTMENT:

5.1.3 Is lumbar (back) support provided (6 inches above compressed seat cushion, 15 inches tall) to reduce gunner fatigue? Yes or No?

COMMENTS:

SEATBACK MEASUREMENT:

5.1.4 Is gunner's seat designed to laterally restrain gunner during violent maneuvers? Yes or No?

COMMENTS:

PROBLEMS:

5.1.5 Is gunner's seat designed so that its forward edge does not restrict blood flow in popliteal area of legs? Yes or No?

COMMENTS:

PROBLEMS:

5.1.6 Is a retractable chest support provided to steady the gunner during sighting and firing? Yes or No?

COMMENTS:

SUPPORT MEASUREMENTS:

5.1.7 Is chest support of appropriate size and is it adjustable so that its positions accommodate the full range of tank gunners (consider arctic/NBC garments)?

Extremely Good			Adequate			Extremely Poor
7	6	5	4	3	2	1

COMMENTS:

5.1.8 Could seat covering material cause the gunner to sweat when he is in prolonged contact with seat? Yes or No?

COMMENTS:

DESCRIBE MATERIAL:

5.1.9 Could seat covering material become excessively hot (burn exposed flesh) when vehicle operates in warm climate? Yes or No?

COMMENTS:

5.2 Gunner's Workspace

5.2.1 Does the full range of tank gunners, wearing the full range of clothing, have the necessary workspace to:

5.2.1.1 Perform powered target acquisition and tracking, using sights, displays, and controls provided?

Extremely Adequate			Adequate			Extremely Inadequate
7	6	5	4	3	2	1

COMMENTS:

PROBLEMS:

METHOD OF EVALUATION:

5.2.1.2 Perform powered gun laying procedures using sights, displays, and controls provided?

Extremely Adequate			Adequate			Extremely Inadequate
7	6	5	4	3	2	1

COMMENTS:

PROBLEMS:

5.2.1.3 Perform manual target acquisition and tracking, using all necessary displays and controls?

Extremely Adequate			Adequate			Extremely Inadequate
7	6	5	4	3	2	1

COMMENTS:

PROBLEMS:

5.2.1.4 Perform manual gun laying procedure using all necessary displays and controls?

Extremely Adequate			Adequate			Extremely Inadequate
7	6	5	4	3	2	1

COMMENTS:

PROBLEMS:

5.2.1.5 Efficiently select designated ammunition type during firing procedure?

Extremely Easy						Extremely Difficult
			Adequate			
7	6	5	4	3	2	1

COMMENTS:

DESCRIBE METHOD:

5.2.1.6 Efficiently use rangefinder during firing procedure?

Extremely Easy						Extremely Difficult
			Adequate			
7	6	5	4	3	2	1

COMMENTS:

METHOD OF EVALUATION:

5.2.1.7 Efficiently select main weapon or coax weapon as required?

Extremely Easy						Extremely Difficult
			Adequate			
7	6	5	4	3	2	1

COMMENTS:

DESCRIBE METHOD:

5.2.1.8 Efficiently access and operate all controls (most distant control should not exceed 29.5 inches from vertical line drawn through seat reference point)?

Extremely Easy						Extremely Difficult
			Adequate			
7	6	5	4	3	2	1

COMMENTS:

PROBLEMS:

5.2.1.9 Maintain satisfactory visibility of all controls and displays during both day and night operations?

Extremely Good			Adequate			Extremely Poor
7	6	5	4	3	2	1

COMMENTS:

PROBLEMS:

5.3 Gunner's Controls and Displays

5.3.1 Are the control and displays provided the best choice for the task that the gunner must perform?

Extremely Good			Adequate			Extremely Poor
7	6	5	4	3	2	1

COMMENTS

PROBLEMS:

5.3.2 Are size, shape, and spacing of controls and displays appropriate for intended usage? Yes or No?

COMMENTS:

PROBLEMS:

5.3.3 Are similar controls and displays grouped for sequential use? Yes or No?

COMMENTS:

PROBLEMS:

5.3.4 Are controls accessible (consider arctic/NBC garments)?

Extremely Easy						Extremely Difficult
			Adequate			
7	6	5	4	3	2	1

COMMENTS:

PROBLEMS:

5.3.5 Are controls and displays adequately illuminated with dimmable light?

Extremely Good						Extremely Poor
			Adequate			
7	6	5	4	3	2	1

COMMENTS:

PROBLEMS:

5.3.6 Are indicator lights correctly colored (based on criteria outlined in 5.3.1.8)? Yes or No?

COMMENTS:

5.3.7 Can indicator lights be tested? Yes or No?

COMMENTS:

METHOD OF OPERATION:

5.3.8 Is nomenclature used appropriately sized and well placed? Yes or No?

COMMENTS:

PROBLEMS:

5.3.9 Is direction of control movement correct (based on criteria outlined in 3.3.2.6)? Yes or No?

COMMENTS:

PROBLEMS:

5.3.10 Is effort required to operate controls (in particular manual traverse and elevation mechanisms) excessive?

Extremely Easy						Extremely Difficult
			Average			
7	6	5	4	3	2	1

COMMENTS:

PROBLEMS:

5.3.11 Have protective covers or guards been placed over controls or switches where appropriate? Yes or No?

COMMENTS:

PROBLEMS:

5.4 Gunner's NBC Protection

5.4.1 If collective protection system is used, is hose readily accessible to gunner? Yes or No?

COMMENTS:

5.4.2 If collective protection system is used, is regulated heater inlet provided and is it easy for gunner to access and use?

Extremely Easy						Extremely Difficult
			Adequate			
7	6	5	4	3	2	1

COMMENTS:

LOCATION:

5.4.3 If other NBC protection system such as ventilated facepiece or cooling vest is used, evaluate its effectiveness for gunner?

Extremely Good						Extremely Poor
			Adequate			
7	6	5	4	3	2	1

COMMENTS:

METHOD OF EVALUATION:

5.5. Gunner's Hatch (if applicable)

5.5.1 Is gunner's hatch easy to open and close using controls provided?

Extremely Easy						Extremely Difficult
			Average			
7	6	5	4	3	2	1

COMMENTS:

DESCRIBE PROCEDURES:

5.5.2 Is gunner's hatch adequate in size, considering all tank gunners and NBC/arctic garments?

Extremely Adequate						Extremely Inadequate
			Adequate			
7	6	5	4	3	2	1

COMMENTS:

HATCH MEASUREMENTS:

5.6 Gunner's Vision

5.6.1 Using the gunner's unity periscope/vision block, can the gunner observe exterior well enough to effectively perform surveillance and initial target acquisition? (to be answered only by experienced crewman)

Extremely Well						Extremely Poor
			Adequate			
7	6	5	4	3	2	1

COMMENTS:

PROBLEMS:

METHOD OF EVALUATION:

5.6.2 Using the gunner's primary sighting system in both day and night modes, can the gunner observe possible targets well enough to effectively engage them when properly operating all associated systems? (to be answered only by experienced crewman)

Extremely Well						Extremely Poor
			Adequate			
7	6	5	4	3	2	1

COMMENTS:

PROBLEMS:

METHOD OF EVALUATION:

5.6.3 Using the gunner's auxiliary sight, can the gunner observe possible targets well enough to effectively engage them when properly operating all associated systems? (to be answered only by experienced crewman)

Extremely Well						Extremely Poor
			Adequate			
7	6	5	4	3	2	1

COMMENTS:

PROBLEMS:

METHOD OF EVALUATION:

6. LOADER'S STATION

6.1 Loader's Seat

6.1.1 Judge effectiveness of loader's seat, considering adjustability, cushioning, size, and back angle.

Extremely Good			Average			Extremely Poor
7	6	5	4	3	2	1

COMMENTS:

DESCRIBE SEAT:

SEAT MEASUREMENTS:

MEASURE ADJUSTMENT:

6.1.2 Is the loader's seat stowable in order to facilitate standing workspace operation within the station? Yes or No?

COMMENTS:

6.1.3 Is lumbar back support adequate to reduce loader fatigue? Yes or No?

COMMENTS:

SEATBACK MEASUREMENTS:

6.1.4 Can loader's seat be configured to provide an open hatch standing platform for use by loader during surveillance or when firing (if applicable) loader's weapon? Yes or No?

COMMENTS:

DESCRIBE MATERIAL:

6.1.5 Could seat covering material cause the loader to sweat when he is in prolonged contact with the seat? Yes or No?

COMMENTS:

DESCRIBE MATERIAL:

6.1.6 Could seat covering material become excessively hot (burn exposed flesh) when the vehicle operates in warm climate? Yes or No?

COMMENTS:

6.1.7 If design intent appears to utilize a seated loader during loading process, judge whether loader interface with ammunition and breech is adequate.

Extremely Adequate			Adequate			Extremely Inadequate
7	6	5	4	3	2	1

COMMENTS:

PROBLEMS:

6.1.8 If loader is seated during loading process, are adequate precautions taken to provide for loader safety?

Extremely Adequate			Adequate			Extremely Inadequate
7	6	5	4	3	2	1

COMMENTS:

DESCRIBE:

6.2 Loader's Workspace

6.2.1 Would the full range of tank loaders, wearing the full range of Army clothing have the workspace necessary to:

6.2.1.1 Perform dynamic operations such as rapid loading of the main gun weapon.

Extremely Adequate			Adequate			Extremely Inadequate
7	6	5	4	3	2	1

COMMENTS:

PROBLEMS

6.2.1.2 Have a "safe" area to stand/sit when the main weapon fires and recoils (safe from breech, spent brass, and sliding doors, if applicable)? Yes or No?

COMMENTS:

DESCRIBE SAFETY FEATURES:

PROBLEMS:

6.2.1.3 Effectively access main gun ammunition.

Extremely Easy			Adequate			Extremely Difficult
7	6	5	4	3	2	1

COMMENTS:

AMMUNITION LOCATIONS:

PROBLEMS:

6.2.1.4 Effectively access and operate any mechanisms necessary to stow/release main gun ammunition.

Extremely Easy						Extremely Difficult
			Adequate			
7	6	5	4	3	2	1

COMMENTS:

PROBLEMS:

6.2.1.5 Effectively access, load, charge, and clear stoppages, etc. for coax weapon as required.

Extremely Adequate						Extremely Inadequate
			Adequate			
7	6	5	4	3	2	1

COMMENTS:

PROBLEMS:

6.2.1.6 Effectively access and operate all loader station controls without exposure to recoil of main weapons.

Extremely Adequate						Extremely Inadequate
			Adequate			
7	6	5	4	3	2	1

COMMENTS:

PROBLEMS:

6.2.1.7 Effectively operate loader's weapons (if applicable).

Extremely Adequate						Extremely Inadequate
			Adequate			
7	6	5	4	3	2	1

COMMENTS:

PROBLEMS:

6.2.1.8 Effectively use loader's periscope (if applicable).

Extremely Adequate			Adequate			Extremely Inadequate
7	6	5	4	3	2	1

COMMENTS:

LOCATION:

DESCRIPTION OF PERISCOPE:

6.3 Loader's Controls and Displays

6.3.1 **Are the controls and displays provided the best choice for the tasks** that the loader must perform?

Extremely Adequate			Adequate			Extremely Inadequate
7	6	5	4	3	2	1

COMMENTS:

PROBLEMS:

6.3.2 Are size, shape, and spacing between controls appropriate for intended usage? Yes or No?

COMMENTS:

PROBLEMS:

6.3.3 Are similar control and display functions grouped for sequential usage? Yes or No?

COMMENTS:

PROBLEMS:

6.3.4 Are controls and displays adequately illuminated with dimmable light?

Extremely Good						Extremely Poor
			Adequate			
7	6	5	4	3	2	1

COMMENTS:

PROBLEMS:

6.3.5 Are indicator lights correctly colored (based on criteria outlined in 3.3.1.8)? Yes or No?

COMMENTS:

PROBLEMS:

6.3.6 Can indicator lights be tested? Yes or No?

COMMENTS:

METHOD OF TESTING:

PROBLEMS:

6.3.7 Is nomenclature used of appropriate size and location? Yes or No?

COMMENTS:

PROBLEMS:

6.3.8 Is direction of control movement correct (based on criteria outlined in 3.3.2.6)? Yes or No?

COMMENTS:

PROBLEMS:

6.3.9 **Is excessive effort (more than 50 foot-pounds of force for two hands or more than 30 foot-pounds of force for one hand) required to operate hand controls?**

Extremely Easy						Extremely Difficult
			Average			
7	6	5	4	3	2	1

COMMENTS:

PROBLEMS:

6.3.10 Have protective covers or guards been placed over controls or switches where appropriate? Yes or No?

COMMENTS:

PROBLEMS:

6.4 Loader's NBC Protection

6.4.1 If a collective protection system is used, is hose readily accessible to loader?

Extremely Easy						Extremely Difficult
			Adequate			
7	6	5	4	3	2	1

COMMENTS:

6.4.2 Can the loader wear the collective protector (with hose attached during the loading process)? Yes or No?

COMMENTS:

PROBLEMS:

6.4.3 Does the collective protection system utilize a regulated inlet air heater that is accessible and easy to use?

Extremely Easy						Extremely Difficult
			Adequate			
7	6	5	4	3	2	1

COMMENTS:

PROBLEMS:

LOCATION:

6.4.4 If other NBC protection system such as ventilated facepiece or cooling vest is used, evaluate its effectiveness for the loader.

Extremely Good			Adequate			Extremely Poor
7	6	5	4	3	2	1

COMMENTS:

METHOD OF EVALUATION:

6.5 Loader's Hatch (See Section 1)

6.6 Loader's Vision

6.6.1 Using the loader's periscope (if applicable) can the loader effectively perform 360° surveillance?

Extremely Good			Adequate			Extremely Poor
7	6	5	4	3	2	1

COMMENTS:

LOCATION:

SIZE:

PROBLEMS:

6.6.2 Can loader see well enough in open-hatch mode (no major obstructions) to effectively perform 360° surveillance?

Extremely Well			Adequate			Extremely Poor
7	6	5	4	3	2	1

COMMENTS:

PROBLEMS:

7. CREW INTEGRATION

7.1 Communications

7.1.1 Are communications (intercom) hookups located in appropriate areas at each station? Yes or No?

COMMENTS:

LOCATION:

PROBLEMS:

7.1.2 Evaluate accessibility of communications hookups, considering NBC/arctic garments, for both initial connections and operations.

Connection:

Extremely Good			Average			Extremely Poor
7	6	5	4	3	2	1

Operations:

Extremely Good			Average			Extremely Poor
7	6	5	4	3	2	1

COMMENTS:

PROBLEMS:

7.1.3 Evaluate whether intercom system will be effective in combat operations (consider speech intelligibility). **(refer to crew's comments and previous reports)**

Extremely Good			Average			Extremely Poor
7	6	5	4	3	2	1

COMMENTS:

METHOD OF EVALUATION:

7.1.4 Will intercom cord at any station (especially loader's) interfere with full mobility during operations?

Always			Average			Never
7	6	5	4	3	2	1

COMMENTS:

PROBLEMS:

7.1.5 Does the intercom system allow quick switching from crewmembers to command net (CVC helmet)?

Extremely Quick			Average			Extremely Slow
7	6	5	4	3	2	1

COMMENTS:

7.1.6 If means have been provided other than intercom system for crewmembers to exchange information, evaluate effectiveness of these means.

Extremely Good			Average			Extremely Poor
7	6	5	4	3	2	1

COMMENTS:

METHOD:

7.2 Crew Considerations

7.2.1 Will such personnel variables as handedness or use of glasses affect crew's ability to operate vehicle in any foreseeable situation?

Always			Sometimes			Never
7	6	5	4	3	2	1

COMMENTS:

PROBLEMS:

7.2.2 Can new drivers and gunners for this vehicle be trained quickly and easily?

Extremely Easy						Extremely Difficult
			Average			
7	6	5	4	3	2	1

COMMENTS:

PROBLEMS:

7.2.3 Are the crewmembers cross-trained in all functions of the vehicle? Yes or No? (to be answered only by experienced crewman)

COMMENTS:

WHY?

7.2.4 Is it possible to operate the vehicle effectively under combat conditions with only a 2-3 man crew?

Extremely Easy						Extremely Difficult
			Average			
7	6	5	4	3	2	1

COMMENTS:

METHOD:

PROBLEMS:

7.2.5 Evaluate effectiveness of crew workload breakdown during combat operations.

Extremely Good						Extremely Poor
			Average			
7	6	5	4	3	2	1

COMMENTS:

8. SAFETY CONSIDERATIONS

8.1 NBC/Arctic Considerations

8.1.1 NBC/Arctic Garments

8.1.1.1 Will changing NBC/arctic garments within the vehicle pose any problems?

Always			Average			Never
7	6	5	4	3	2	1

COMMENTS:

PROBLEMS:

8.1.1.2 Could NBC/arctic garments significantly hamper evacuation procedures?

Always			Average			Never
7	6	5	4	3	2	1

COMMENTS:

METHOD OF EVALUATION:

8.1.1.3 Is workspace adequate to permit donning/doffing of NBC/arctic garments?

Extremely Adequate			Adequate			Extremely Inadequate
7	6	5	4	3	2	1

COMMENTS:

8.1.2 Judge effectiveness of NBC decontamination measures, considering types available for vehicle and crew and amount stowed on vehicle. (Based on U.S. Army quantities and procedures and crew comments)

Extremely Good			Average			Extremely Poor
7	6	5	4	3	2	1

COMMENTS:

LOCATION:

TYPE:

AMOUNT:

8.2 Lighting

8.2.1 Driver's Exterior Lights

8.2.1.1 Are driver's lights adjustable to illuminate ideal field of vision? Yes or No?

COMMENTS:

DIMMER LOCATION:

8.2.1.2 Are driver's lights adequate and appropriate for all required tasks?

Extremely Adequate			Adequate			Extremely Inadequate
7	6	5	4	3	2	1

COMMENTS:

8.2.2 Interior Lights

8.2.2.1 Is interior illumination adequate and appropriate for all required tasks (consider shadowing as well)?

Extremely Adequate			Adequate			Extremely Inadequate
7	6	5	4	3	2	1

COMMENTS:

METHOD OF EVALUATION:

8.2.2.2 Is interior lighting easily accessible and operable (consider NBC/arctic garments)?

Extremely Easy			Average			Extremely Poor
7	6	5	4	3	2	1

COMMENTS:

LOCATION:

PROBLEMS:

8.2.2.3 Has lighting been effectively safeguarded against inadvertent activation? Yes or No?

COMMENTS:

PROBLEMS:

5.3 Water

5.3.1 Is an adequate amount of water stowed on vehicle for prolonged operations (138 gallons based on re-supply over a period of 3 days)?

Extremely Adequate			Adequate			Extremely Inadequate
7	6	5	4	3	2	1

COMMENTS:

AMOUNT:

LOCATION:

5.3.2 Is water stowed so as to avoid hampering crew's actions? Yes or No?

COMMENTS:

PROBLEMS:

5.3.3 Is water readily accessible to each crewmember? Yes or No?

COMMENTS:

PROBLEMS:

5.3.4 Is the task of water re-supply reasonably quick and easy?

Extremely Easy			Average			Extremely Difficult
7	6	5	4	3	2	1

COMMENTS:

WHERE:

PROBLEMS:

8.3.5 Is water supply adequately insulated against extremes of heat and cold?

Extremely Adequate			Adequate			Extremely Inadequate
7	6	5	4	3	2	1

COMMENTS:

METHOD:

8.4 [illegible]

8.4.1 [illegible] throughout crew compartment (especially [illegible])?

Extremely Adequate			Adequate			Extremely Inadequate
7	6	5	4	3	2	1

COMMENTS:

PROBLEMS:

8.4.2 Is heater adjustable to accommodate full range of climate conditions? Yes or No?

COMMENTS:

ADJUSTMENTS:

8.4.3 Evaluate practicality of heater, considering reliability and accessibility, as well as ease of repair?

Extremely Easy			Average			Extremely Difficult
7	6	5	4	3	2	1

COMMENTS:

LOCATIONS:

PROBLEMS:

8.4.4 Are heater vents safeguarded to decrease risk of personnel injuries due to excessive heat? Yes or No?

COMMENTS:

HOW:

VENT LOCATION:

8.5 Ventilation: Cooling/Air Cleaning

8.5.1 Is ventilation adequately distributed throughout all crew compartments?

Extremely Adequate			Adequate			Extremely Inadequate
7	6	5	4	3	2	1

COMMENTS:

PROBLEMS:

METHOD OF EVALUATION:

8.5.2 Is ventilation system fully adjustable to accommodate full range of climate conditions? Yes or No?

COMMENTS:

8.5.3 Evaluate practicality of ventilation system, considering reliability and accessibility, as well as ease of repair.

Extremely Easy			Average			Extremely Difficult
7	6	5	4	3	2	1

COMMENTS:

LOCATION:

8.5.4 Is ventilation system safeguarded against drawing toxic fumes from exterior of vehicle into crew compartment? Yes or No?

COMMENTS:

PROBLEMS:

8.6 General Considerations

8.6.1 Does vehicle provide adequate space for allowing crew to enter a rest cycle without dismounting vehicle?

Extremely Adequate			Adequate			Extremely Inadequate
7	6	5	4	3	2	1

COMMENTS:

REST METHODS:

PROBLEMS:

8.6.2 Is crew adequately safeguarded from possible injuries during traversal or elevation/depression of main weapon?

Extremely Adequate			Adequate			Extremely Inadequate
7	6	5	4	3	2	1

COMMENTS:

PROBLEMS:

LOCATION OF GUARDS:

8.6.3 Are interior surfaces padded so as to provide adequate protection against crew injuries without hampering operations or maintenance?

Extremely Good			Average			Extremely
7	6	5	4	3	2	1

COMMENTS:

PROBLEMS:

8.6.4 Does vehicle satisfy current Army standards concerning:

8.6.4.1 Noise (steady state or vehicular, and impulse or weapon). Yes or No?

COMMENTS:

8.6.4.2 Vibration/shock (vehicular and weapon). Yes or No?

COMMENTS:

8.6.4.3 Toxic fumes (consider CO^2, NO, NH, and SO). Yes or No?

COMMENTS:

8.6.5 Is vehicle equipped with an automatic fire suppression system (AFSS)? Yes or No?

COMMENTS:

TYPE:

8.6.5.1 Does the AFSS have appropriate sensitivity to activate soon enough to decrease personnel injury without activating unnecessarily? Yes or No?

COMMENTS:

PROBLEMS:

8.6.5.2 Is the AFSS practical, considering reliability, accessibility, and ease of repair?

Extremely Easy						Extremely Difficult
			Average			
7	6	5	4	3	2	1

COMMENTS:

LOCATION:

8.6.5.3 Is the AFSS adequately safeguarded against inadvertent activation, such as heat from personal heater? Yes or No?

COMMENTS:

8.6.6 Are portable fire extinguishers adequate in number and location?

Extremely Adequate			Adequate			Extremely Inadequate
7	6	5	4	3	2	1

COMMENTS:

AMOUNT:

LOCATION:

PROBLEM:

9. MAINTENANCE/STOWAGE CONSIDERATIONS

9.1 Preventive Maintenance Checks and Services (PMCS)

9.1.1 Are all PMCS checkpoints easily identifiable and accessible?

Extremely Easy			Average			Extremely Difficult
7	6	5	4	3	2	1

COMMENTS:

PROBLEMS:

9.1.2 Is available workspace adequate for performing checks and services as required?

Extremely Adequate			Adequate			Extremely Inadequate
7	6	5	4	3	2	1

COMMENTS:

PROBLEMS:

9.1.3 Are all dipsticks and gauge levels easily readable?

Extremely Easy			Average			Extremely Difficult
7	6	5	4	3	2	1

COMMENTS:

PROBLEMS:

9.1.4 Are all cautions and warning labels encountered during PMCS operations effective, considering size, location, coloring, and message?

Extremely Good			Average			Extremely Poor
7	6	5	4	3	2	1

COMMENTS:

9.1.5 If PMCS requires the use of special tools, are these tools stowed on the vehicle for ready access? If yes, explain type, reason, and location of tools.

COMMENTS:

9.1.6 Do the vehicle's PMCS operations require maintenance procedures of unreasonable complexity or length? Yes or No?

COMMENTS:

PROCEDURES:

9.1.7 If PMCS operations call for specialized diagnostic equipment, is such equipment accessible as required? Yes or No?

COMMENTS:

9.2 Interior Repairs

9.2.1 Are cables routed so as to facilitate interior repair work (consider locations and accessibility)?

Extremely Good						Extremely Poor
			Average			
7	6	5	4	3	2	1

COMMENTS:

9.2.2 Are cables and indicators, etc. adequately safeguarded in order to reduce possibilities of damage? Yes or No?

COMMENTS:

9.2.3 Are cables and indicators, etc. marked in order to make identification easier (consider labels and color codes)? Yes or No?

COMMENTS:

9.3 Overall Repair Considerations

9.3.1 Is it possible to short track the vehicle in an emergency? Yes or No?

COMMENTS:

METHOD OF EVALUATION:

9.3.2 Does the vehicle have the capacity of stowing an adequate amount of spare parts and tools (road wheels, track blocks, firing pins, pry bars, etc.) for transport into combat operations?

Extremely Adequate			Adequate			Extremely Inadequate
7	6	5	4	3	2	1

COMMENTS:

PROBLEMS:

9.3.3 Does the crew have some reasonable amount of battle damage assessment/repair capability, along with the necessary parts and tools (to include fire control system maintenance)? Yes or No?

COMMENTS:

METHOD OF EVALUATION:

9.3.4 Judge difficulty of removing the powerpack and replacing it with a new pack (based on full crew).

Extremely Easy			Average			Extremely Difficult
7	6	5	4	3	2	1

COMMENTS:

METHOD OF EVALUATION:

PROCEDURE:

9.3.5 Judge difficulty of breaking track (consider workspace and linkage assemblies).

Extremely Easy						Extremely Difficult
7	6	5	Average 4	3	2	1

COMMENTS:

METHOD OF EVALUATION:

PROCEDURE:

9.4 Stowage Considerations

9.4.1 Is fuel inlet readily accessible and able to be effectively manipulated in any weather (consider NBC/arctic garments)?

Extremely Easy						Extremely Difficult
7	6	5	Average 4	3	2	1

COMMENTS:

PROBLEMS:

9.4.2 Is personnel equipment stowed in a readily accessible location where it can be adequately secured and protected from weapons effects?

Extremely Adequate						Extremely Inadequate
7	6	5	Adequate 4	3	2	1

COMMENTS:

LOCATION:

9.4.3 Is space available for stowing rations for combat operations?

Extremely Adequate						Extremely Inadequate
7	6	5	Adequate 4	3	2	1

COMMENTS:

LOCATION:

9.4.4 Is ammunition effectively stowed, in such a manner as to allow rapid access and easy internal transfer?

Extremely Easy						Extremely Difficult
			Adequate			
7	6	5	4	3	2	1

COMMENTS:

LOCATIONS:

METHOD OF TRANSFER:

9.4.5 Is ammunition stowed in a container that reduces risk of explosion and personnel injury during combat operations? Yes or No?

COMMENTS:

9.4.6 Evaluate difficulty of uploading/downloading vehicle, considering hatches, hull obstructions, and internal stowage facilities.

Extremely Easy						Extremely Difficult
			Average			
7	6	5	4	3	2	1

COMMENTS:

PROBLEMS:

METHOD:

10. COMBAT OPERATIONS

10.1 If crew is required to make pre-combat systems checks, are tests reasonable in number, length, and complexity? Yes or No?

COMMENTS:

10.2 Are the boresighting and zeroing procedures reasonable in length and complexity?

Extremely Easy						Extremely Difficult
			Average			
7	6	5	4	3	2	1

COMMENTS:

METHOD:

10.3 Does the vehicle's targeting system allow for a rapid and logical sequence of firing commands for effective engagement or targets?

Extremely Good						Extremely Poor
			Average			
7	6	5	4	3	2	1

COMMENTS:

METHOD OF EVALUATION:

DESCRIBE PROCEDURES:

10.4 Does the vehicle impose severe mental or physical demands on operators in foreseeable combat operations?

Never						Always
7	6	5	4	3	2	1

COMMENTS:

METHOD OF EVALUATION:

10.5 Will vibrations and/or accelerations have adverse effects upon the vehicle's performance? Yes or No? (If yes, explain)

COMMENTS:

METHOD OF EVALUATION:

10.6 Can data be effectively entered manually into the fire control system under degraded conditions (i.e., ammunition, range, etc.)? Yes or No?

COMMENTS:

DESCRIBE PROCEDURES:

PROBLEMS:

10.7 Does the design of the vehicle allow for the development of training aids and instructional devices to complement operator training and improve crew performance? Yes or No?

COMMENTS:

TRAINING PROCEDURES:

END

4-88

DTIC